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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/483,859 01/17/00 GAUTAM

B 2771-221DIV

EXAMINER

IM31/0803

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PADGETT, M	
ART UNIT	PAPER NUMBER

1762

8

DATE MAILED:

08/03/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/483,859

Applicant(s)

Bhandari et al

Examiner

M. L. Padgett

Group Art Unit

1762

— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☒ Responsive to communication(s) filed on 4/24/00
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 5 - 20 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) 17 - 20 is/are allowed.
- ☒ Claim(s) 5 - 15 is/are rejected.
- ☒ Claim(s) 16 is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☐ All ☐ Some* ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 3
- ☐ Interview Summary, PTO-413
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Other _____

Office Action Summary

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1.

This application contains claims directed to the following patentably distinct species of the claimed invention: (A) Tantalum:

- (i) tethered amine tantalum complexes;
- (ii) organatantalum β -dimines;
- (iii) tantalum diamide complexes;
- (iv) tantalum amides compounds of $Ta(NRR')_5$ formula;
- (v) tantalum β -ketoimines;
- (vi) tantalum cyclopentadienyl compounds
- (vii) $Ta(NR_1R_2)_x(NR_3R_4)_{5-x}$
- (viii) $Ta(NR_1)(NR_2R_3)_3$
- (ix) $Ta(SiR_1R_2R_3)_x(NR_4R_5)_{4-x}$
- (x) $(Cp^n) Ta(SiR_1R_2R_3)_x(NR_4)_{4-x}$

(B) Titanium:

- (i) $Ti(NR_1R_2)_x(NR_3R_4)_{4-x}$
- (ii) $Ti(SiR_1R_2R_3)_x(NR_4R_5)_{4-x}$
- (iii) $(Cp^n)_2 Ti(SiR_1R_2R_3)(NR_4R_5)$.

Pick one of (A) Ta or (B) Ti, plus one sub species listed there under. If applicant states that any of (o-x) are equivalent, they will be recombined, i.e. of A(o) is a species of one of A(i)-(x).

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2.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claims ^{5 and} 7-12 are generic to both Ta and Ti, while for at least some Ta species are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 ^{CRF} ~~CAR~~ 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

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3.

During a telephone conversation with Steven Hultquist on July 21, 2000 and July 25, 2000 a provisional election was made without traverse to prosecute the invention of species A(iv), tantalum amide compounds of Ta(NRR')₅, claims 5-6 and 16-20 have limitations directed to this species. Affirmation of this election must be made by applicant in replying to this Office action. Claim limitations to species A(i-iii), v-x) and B(i-iii) are withdrawn from further consideration by the examiner, 37 CAR 1.142(b), as being drawn to a non-elected invention.

Applicant confirmed that pentakis (N-methyl, N-ethylamido) Tantalum (previously labeled species A(v)) is a subspecies of A(iv).

(4) Claims 5-16 are objected to or rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In elected species (iv), there appear to be some typographical errors in lines 4 and 5, i.e., the improper subscripting of the hyphen and a missing operator between R and R¹, where the later makes the claim vague and indefinite. The examiner assumes that the not equals sign in the patent belongs there.

It is further noted that in species (vii), (ix) and maybe (x), that the variable x needs defining. Also in the last two, are all the "x" variables in each species the same, if not a different variable should be used for each different value range, per species.

In claim 6, since there is dependance from claim 5 the species in this claim are objected to for failing to use articles showing antecedent basis. Further note, as long as one is not changing,

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i.e. selecting only a part of the conditions describing the species, it is not necessary to repeat the entire formulas description if you have properly shown antecedent basis with a correct article.

5.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6.

Claims 5-8 and 10-11 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Wilkinson.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson.

As noted in the parent, Ex.I and IV in Wilkinson show making bis(cyclopentadienyl) Ta trihydride, which reads an applicant's species (vi), where R=H and uses a solvent, such as benzene or glycol dimethyl ether. In Ex.IX the compound was used in metal coating Ta on steel, however

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in col. 6, lines 26-37, it is noted that use of carrier gases in the vapor deposition process results in nitrides, hence use of the claimed compound to deposit TaN by a CVD process was seen to be known. That it was not what Wilkenson desired does not change the existence of process being known.

Claim 9 differs by claiming different solvents, however benzene and toluene are homologous solvent, hence would have been expected to be obvious alternatives, with toluene being preferred these days as it is less toxic.

7. The article by Ovchinnikov et al, Organometallic chemistry in the USSR, notes the existence of $(\overset{\text{SiTi}}{\text{Si}}\text{Me}_2)_3$ as discussed in the parent case, but provides no suggestions on its use.

Similarly Lappert et al. (P. 471-474) show the existence of $[\text{TiNMe}_2(\text{NPr}_2)_3]$ but fail to suggest its use for vapor deposition of TiN.

8. Claims 5-6 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Shen et al.

As noted in the parent, the compound $\text{Ti}[\text{N}(\text{CH}_3)\text{C}_2\text{H}_5]_4$ disclosed by Shin et al., reads on species (VII) and (IX) for $\text{X}=\text{O}$, which is undefined in the claims. This compound is taught to be a CVD precursor to TiN deposits, which deposition on microelectronic substrates as barrier layers, conformal coatings, applied to vias in multi level metallization is disclosed in the abstract and introduction for CVD TiN films. Under CVD in the experimental section, use of liquid

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bubbler is taught, but it is a liquid at room temperature so no solvent is taught. While Cu metallized substrates are not specifically taught for use in its deposition, copper is a desirable and conventional metalization element in multi layer metallizations in IC devices, hence, would have been obvious to employ in the devices suggested by Shin et al., if applicants were specifying the TiN instead of TaN.

9.

Claims 5-6 and 12-15 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Sun et al.

Sun et al. teach CVD of TaN from a precursor Ta (NEt_2)₃ (N^tBu) where it corresponds to applicants' species (viii) with R₁=^tBu and R₂=R₃=Et. The TaN is used as a diffusion barrier on Cu metallizations of semiconductor devices. See the abstract, figures and summary.

Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al., alone or in view of Wilkenson.

While Sun et al. teach to vaporize their precursor for their CVD process, no details on its state before hand are supplied, however, ^{use of a} bubbler when the precursor is in solution ^{is} ~~are~~ standard operating procedure^s, hence it would have been obvious to use known solvents for the compound. Alternately, Wilkenson who is vaporizing an analogous Ta organic amine conforming compound shows use of solvent, that include aromatics that are suggestive of toluene as discussed above.

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10.

Also of interest is ~~Winter~~ with complex Ta N-containing organic compounds that also contain halide as ligands, so differ from the present case.


11.

The chosen species was not found so further search was made resulting in the above rejection, with claims 17-20 appearing allowable

Claim 16 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

12.

Any inquiry concerning this communication should be directed to M. L. Padgett at telephone number (703) 308-2336 on Monday-Friday from about 8:a.m. - 4:30 p.m.; and Fax Number (703) 305-5408 (official), or 305-6078 (unofficial).


MARIANNE PADGETT
PRIMARY EXAMINER
GROUP 1700